DOCUMENT RESUME

ED 425 708 IR 019 163

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TITLE	Assessing the Classroom Environment of the Virtual Classroom.
PUB DATE	1998-10-00
NOTE	13p.; Paper presented at the Annual Meeting of the Mid-Western Educational Research Association (Chicago, IL, October 14-17, 1998).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Classroom Environment; Classroom Research; Computer Assisted Instruction; Computer Mediated Communication; *Course Evaluation; Data Analysis; *Distance Education; Evaluation Methods; Graduate Study; Higher Education; Measurement Techniques; Qualitative Research; Student Attitudes; Student Surveys; World Wide Web
IDENTIFIERS	*College University Classroom Environment Inventory; *Virtual Classrooms

ABSTRACT

This pilot study was conducted in order to determine whether a virtual classroom can be assessed, and whether it can be done using already proven techniques for classroom environment assessment. Study participants were 20 graduate students in education enrolled in three different courses offered at a distance via the World Wide Web. Each of the courses was offered by the same instructor and was designed following the same principles. Data were gathered by mailing each student a copy of the College and University Classroom Environment Inventory (CUCEI), which is composed of 49 questions that rate the following seven different factors of the college classroom environment: student cohesiveness; individualization; innovation; involvement; personalization; satisfaction; and task orientation. Thirteen surveys were returned for a 65% return rate. Researchers also collected qualitative information including papers and presentations; discussion questions; online lectures; peer discussion and feedback; and student reflective journals and time logs. Findings indicated that the survey results backed up the qualitative data, and that the CUCEI was promising in its ability to assess the virtual classroom environment and provide instructors with valuable information about student perceptions of the environment. (DLS)

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ED 425 708

Assessing the Classroom Environment of the Virtual Classroom

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Paper presented at the Annual Meeting of the Mid-Western Educational Research Association (MWERA), Chicago, Illinois, October 14-17, 1998

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Introduction

Distance Learning is by no means a new phenomenon. However, the new technologies provide a twist to distance learning that is making it grow and expand at overwhelming numbers. The National Center for Educational Statistics reports that in 1995, a third of US post-secondary schools offered distance education courses with another quarter of the population planning to do so in the next three years. When you then consider the rapid proliferation of internet-based courses as a distance learning option and then consider that the World Wide Web (WWW) has only been "popular" for the past 5 years, it is indeed overwhelming.

While the numbers alone are enough to amaze and dazzle, what is more interesting are the instructional design and pedagogical issues that form the basis of these courses (Ritchie & Hoffman, 1997). The technical skills to build a course-web site and all the accompanying technologies are merely psychomotor skills ranging from the simple to the highly complex, and many courseware packages now remedy the need for instructors to worry about developing those skills (Hansen & Frick, 1997). Hill (1997) lists some of these key issues, which include the pedagogical, technological, organizational, institutional, and ethical. What is missing from these areas of research focus is the psychosocial environment of the classroom. Research has demonstrated that the classroom environment, in terms of psychosocial factors, accounts for appreciable amounts of variance in the cognitive and affective outcomes for students (Fraser, 1981).

However, can a classroom environment which is in fact not physically tangible, and it exists on the "virtual space" be assessed? And, if there really is such a thing as a virtual classroom environment, can it be assessed using already proven techniques for classroom environment assessment. That query is the focus of this preliminary examination of the virtual classroom environment.

Background

Individuals do not act outside the context of their environment. The bond of this physical and social environment interaction with the individual has troubled philosophers since the time of Aristotle (Huebner, 1980). The question therefore consistently posed is how can the environment serve to enhance the development and learning of the student?

The study of the classroom environment accesses and assesses the shared perceptions of the instructors and students situated in that environment (Fraser, 1989). The advantage of this type of assessment over outsider observational data collection is that both students and instructors have the long-term viewpoint of the class and are not basing their perceptions on small sample observations. The instructors and students also place their assessment in context with other educational experiences.

Moos (1974) provides a scheme where there are three classifications to describe human environments. The first is the relationship dimension which describes the nature and intensity of personal relationship and the extent to which there is mutual support and

assistance. The second dimension is called the personal development dimension and concerns the degree to which personal growth and self-enhancement occur within an environment. The third dimension is systems maintenance which measures how orderly and responsive the environment is to change.

A number of instruments have been developed to assess a variety of human environments, including k-12 classrooms, psychiatric hospitals, prisons, and residence halls. One instrument developed by Moos and Trickett (1974) is called the Classroom Environment Scale (CES) and has been used in many of these environments even though it's initial development was for the secondary classroom. DeYoung (1977) piloted a short-form of the CES at the university level.

Another instrument developed specifically for higher education is called the College and University Classroom Environment Inventory (CUCEI). This instrument has seven scales which cover the areas of Personalization, Involvement, Student Cohesiveness, Satisfaction, Task Orientation, Innovation, and Individualization (Fraser, 1986). The scales determine the fit between a student's perception of the actual classroom environment and their preferred environment. The CUCEI was developed expressly for the purpose of assessing environments of higher education classrooms and was developed for classes of 30 students or less and not intended for large lecture classes or lab settings.

In possible conflict with the assessment of a classroom environment (the traditional physical space) is the concept of the virtual classroom, such as courses offered over the World Wide Web. Through Internet classrooms, students and faculty can communicate asynchronously and synchronously. Learning on the Internet can take the form of (a) electronic mail (e-mail) and electronic discussion groups (listservs or chat rooms); (b) bulletin boards or newsgroups; (c) downloadable course materials or tutorials; (d) interactive tutorials on the Web; (e) real-time, interactive conferencing; and (f) infomatics, the use of on-line databases (Kerka, 1996). These methods provide usage, response and impact considerations different from the traditional classroom setting (Kuehn, 1994).

The study of classroom environment is critical if teachers want to be able to exercise control over the environment to the betterment of learning. However, with the growth of distance learning, it is also important to determine what instructor and student perceptions are of the virtual environment. Verduin and Clark (1991) state that the separation of teacher and learner does not allow for a truly shared learning experience, but Moore (1973, 1994) concludes that distance learners must be emotionally independent, self-motivated, and more autonomous in order to compensate for the transactional distance in the distance classroom. Initial examinations are being made of student perceptions of this learning environment (Powers & Mitchell, 1997). This study showed that students do perceive that at least two of Moos' dimensions are present (personal development and relationship). The question does remain unanswered as to whether an effective person-environment fit is taking place and the extent to which the instructor might be able to control those factors. This paper describes a pilot study which

makes an initial examination of the virtual classroom environment in terms of traditional measures.

Methodology

This study details the results of a pilot study which examined the classroom climate or environment of a virtual course. Study participants were graduate students enrolled in three different courses offered at a distance over the World Wide Web (WWW). Each of the three courses was offered by the same instructor and was designed following the same design principles. One course dealt with the history and theories of Instructional Technology. The second course focused on information technology and media literacy. The topic of the third course was on the technologies of distance learning. Twenty students were enrolled in these three different courses.

The courses consisted of lecture notes placed by the instructor on the WWW, readings of seminal works on the topics, classroom discussion completed through web conferencing and email discussion groups, synchronous chat sessions and presentations made by the students and posted to the WWW. Course requirements included consistent, regular weekly participation in class discussion on the web and response to peers' presentations and ideas.

As an exploratory study into the evaluation and assessment of the virtual classroom environment, data was gathered from a variety of sources. First, a traditional classroom environmental assessment tool was used. Each student (20) was mailed a copy of the College and University Classroom Environment Inventory (CUCEI) (Fraser, Treagust & Dennis, 1986). See Table 1 for sample questions from the CUCEI. The CUCEI is composed of 49 questions which rate seven different factors of the college classroom environment: Student cohesiveness; individualization; innovation; involvement; personalization; satisfaction; and task orientation. Comprehensive validation research has been completed on this instrument to confirm the internal consistency reliability and discriminant validity of the instrument (Fraser et al, 1986). Students rate each question on a four-point scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Table 1: Sample Items from CUCEI

Student Cohesiveness 5. Students know exactly what has to be done in our class. 7. All students in the class are expected to do the same work, in the same way, and in the same time. (scores reversed)	Individualization 8. The instructor talks individually with students. 14. Students are generally allowed to work at their own pace.
Innovation 15. The instructor goes out of his/her way to help students. 19. The group often gets sidetracked instead of sticking to the point. (score reversed)	Involvement 23. Students in this class pay attention to what others are saying. 25. Classes are a waste of time. (scores reversed).
Personalization 32. Classes are boring. (scores reversed). 33. Class assignments are clear so that everyone knows what to do.	Satisfaction 37. There are opportunities for students to express their opinions in this class. 39. Students enjoy going to this class.
Task Orientation 44. The instructor dominates class discussion. (scores reversed) 46. Classes are interesting.	

This instrument can be delivered in two different formats, preferred and actual. The questions as worded in Table 1 represent the actual format, i.e. how students perceive a classroom environment to actually be. In the preferred form, the questions would be the same, but the word "would" is inserted. For example, "Students *would* know exactly what has to be done in our class. For the purposes of this study, only the actual form was used because the research team wanted to determine if this instrument could play a role in the evaluation of virtual classroom environments.

Twenty students were mailed a copy of the CUCEI, along with an explanation letter and a postage-paid, addressed return envelope. Thirteen surveys (.65%) were returned in sufficient time to be included in this discussion. The data from the surveys was entered into SPSS for analysis. Sums were generated for each environmental scale and then means and standard deviations were found for each of these sums (the CUCEI is scored on a 1-5 scale with 1 being Strongly Agree, 5 being Strongly Disagree and 3 given to no answer). Additionally, for investigating the usefulness of the instrument for virtual

classrooms, means were generated for each survey item, as well as frequency data for each item to determine the degree to which students considered the questions to be answerable from the perspective of a virtual classroom.

In addition to the data collected with the CUCEI, qualitative information from the course was also collected in order to assist with interpretation of CUCEI results. The data included papers and presentations, discussion questions, on-line lectures, peer discussion and feedback, and student reflective journals and time logs. All qualitative data was content analyzed in terms of the factors of the CUCEI. This process was completed to examine what factors the students and the instructor perceived as important virtual classroom climate issues.

Results and Discussion

The information received from administration of the CUCEI provided valuable information about the classroom environment of a web-based class. The results of the survey provided quantifiable data to support the qualitative information gathered and the instructor's impressions. First, the results which lead to the viability of the use of the CUCEI in this context will be examined, followed by a discussion on the student assessment of their virtual classroom environment.

Use of CUCEI for Virtual Classes. Of the forty-nine questions asked in the CUCEI, one or more students did not answer 15 of the questions. At first glance that seems to be a large percentage of the total number of questions. However, it is important to see how many students didn't answer these questions in order to make determinations on the viability of the instrument (See Table 2).

The researchers predetermined that one or two blank responses was not a critical issue. There could be numerous reasons why a student does not answer a certain item. When three or more students do not answer that same item, than the time must be taken to examine the possible reasons behind the lack of response. Of the original 15 items which received at least one non-answer, only 6 remained when this qualifier is used. These six items appear to fall into two different categories: lack of a tangible, physical classroom to assess and the nature of an asynchronous web-based environment.

When students participate in a web-based course, their "classroom" could be one of dozens of places. For example, a student might consider the computer lab where s/he works to be his/her classroom. A student who works mostly or entirely at home might consider that particular space to be where s/he attends class. Other students might be able to think in the more abstract and consider the website itself to be the classroom in which they will function. Finally, other students may not be able to conceptualize a classroom that does not exist within four walls, has desks, tables and chairs, chalkboard, and needs a good cleaning.

Table 2 - Frequency Data on Unanswered CUCEI Items

Item	Scale	Frequency
4. The students look forward to coming to class.	Cohesiveness	3
13. New and different ways of teaching are seldom used in the class.	Individualization	1
16. Student "clock watch" in this class.	Innovation	2
19. The group often gets sidetracked instead of sticking to the point.	Innovation	2
21. Students have a say in how class time is spent.	Innovation	2
25. Classes are a waste of time.	Involvement	2
38. The instructor seldom moves around the classroom to talk with students.	Personalization	5
31. It takes a long time to get to know everybody by his/her first name in this class.	Personalization	1
32. Classes are boring.	Personalization	1
34. The seating in this class is arranged in the same way each week.	Personalization	7
39. Students enjoy going to this class.	Satisfaction	3
40. This class seldom starts on time.	Satisfaction	3
41. The instructor often thinks of unusual class activities.	Satisfaction	3
45. Students in this class are not very interested in getting to know other students.	Task Orientation	1
46. Classes are interesting.	Task Orientation	1

Therefore it is not surprising that those questions that appear to concern a physical classroom space were unanswerable to students. In particular, those questions that deal

with the arrangement of the room and the degree to which the instructor moves around the room. The mean score for Item 29 (instructor moves around classroom) was 2.69, indicating that those students who answered the item tended to agree with the question. The mean score for Item 34 (seating arrangement) was 2.38, once again indicated that those who responded agreed with the statement. One example, and a typical example, of how some students might struggle with the concept of a virtual classroom that doesn't have the characteristics of a traditional classroom is represented in this quote from a student who is trying to figure out where all the discussion points fall together:

> I noticed that [another student] sent the responses to her questions [the listserv]. This is not our chat line, do we use this address only for our assignments? Thanks again for your help I am working on getting a picture, but have not been successful up to this date.

The student has had no problems with the assignments; rather her frustration lies in figuring out where in the virtual classroom she needs to go to tell the class as a whole something. This type of struggle would not be typical in the traditional seminar classroom.

The remaining troublesome items fall under the category of the asynchronous nature of the classes (i.e., students access course materials at any time). These items concern student going to a class (which might be construed as physically going) and class starting time. The mean for item 4 (students look forward coming to class) was 2.23 and shows that the students who did answer the item agreed with the question, and the same with Item 39 (students enjoy going to class) with a mean of 2.15. In terms of the issue of class starting time (Item 40), even though 3 students didn't feel as though they could answer the question, the mean of 1.92 indicates strong agreement with the statement. The final item under this category, involving unusual class activities (Item 41), had a mean of 2.69, and again demonstrates agreement with the statement. Under this category, each of these items were left unanswered by 3 students, and the same students each time.

E-mail and listservs are examples of asynchronous communication. The message can be read, studied, and a response sent at staggered times and at the participant's convenience. E-mail provides students direct contact with each other and the instructor without the time restraints of office hours and class time, or space restraints of distance (Kerka, 1996; Partee, 1996). The flexibility of asynchronous class structures superimposed on the responsibility necessary to function in an asynchronous environment may cause problems for some students and generate uncertainty as to when and where they should be doing class work, as demonstrated in the following journal entry by a student:

> I am sorry. I read your message about not posting until Tuesday afternoon, but I posted my 15th questions today. I am trying to get ahead because I am going to be gone next week. So sorry. Let me know if I need to send again. Thanks for your patience. When do we need to be available to chat tomorrow?

Although none of what the student worried about was a serious problem, the ability to do class work at times other than regular classroom hours was providing some dissonance for her.

Overall, the CUCEI items appeared to fair well in the virtual classroom. The two items that were most difficult for students to answer were not impossible for everyone to answer. Furthermore, the difficulty which might arise from conceptualization of the virtual classroom environment might be alleviated as the prevalence of web-based courses grows and student experience and understanding of the environment also grows.

Assessment of the Virtual Classroom Environment. The CUCEI assesses seven different factors of the classroom environment. On each of these factors, an individual's total score of 7 would indicate high satisfaction (Strongly Agree) with the environment, and a score of 35 would indicate high dissatisfaction (Strongly Disagree). Table 3 provides the minimum, maximum, mean and standard deviation score for each scale.

Scale	Minimum Sum	Maximum Sum	Mean	Std. Dev.
Student Cohesiveness	9	23	14.23	3.98
Individualization	10	25	14.07	4.09
Innovation	9	23	14.46	4.33
Involvement	9	19	14.54	2.84
Personalization	12	26	16.23	3.66
Satisfaction	7	24	13.15	4.45
Task Orientation	9	22	14.84	3.46

For the most part, the scores from each scale are similar to the others scales. The mean scores for the seven items indicate high agreement with the statements in the survey depicting the classroom environment. The strongest degree of agreement appears to be on the Involvement scale. Students felt that the instructor was involved with the students and that the students were able to be involved and participate with each other. This information from the instrument provides invaluable feedback because it addresses one of the biggest fears both students and faculty have about internet- based courses, and distance education courses in general. However, the ability of students to adapt to this environment and to take the initiative for making those connections among participations is exemplified in this message that a student sent as a welcome message (unsolicited) to all other students in the class:

> I'm looking forward to working with you all, those who were in class today and those who I'll meet in cyberspace. Good luck.

For those students who desire and need the involvement with others, the virtual environment may require and force them to be more active about developing relationships as opposed to passively awaiting others to do so for them.

It is also interesting to note that the other scale that stands out is the Personalization scale. This scale not only had higher minimum, maximum, and mean scores, but also four of the

seven items on the scale were not answered by at least one individual. Two of these four items were the items that had large numbers of students not responding (Items 29 and 34). This scale concerns how students assess the environment in terms of responsiveness to them as a person, and to what degree they are able to assert their personality. Again, the difficulty some students felt about answering questions dealing with the make-up of the classroom might have affected the overall results of the scale. Students in these three web-based courses spend a great deal of time presenting their work to all students in the class and receiving constructive feedback. Students consistently comment about how much they appreciate hearing from the peers about their work and the recognition it places upon their efforts, as well as the way this sharing forced them to reflect back on their own work:

> Very impressive and detailed paper. Your insight on aspects on privacy and the Internet was very good. You raised many questions and forced me to rethink many simple ideas such as the privacy US mail has and the lack of privacy Internet communication has. I look forward to learning from your perspective.

Overall, the CUCEI provided valuable feedback about the classroom environment. It placed the comments collected by students in another framework that was more quantifiable. As an assessment tool of the virtual environment, it generally appeared to provide good information.

Conclusion

The CUCEI appears to be promising in its ability to assess the virtual classroom environment and provide instructors with valuable information about student perceptions of the environment. One thing this pilot study did not do was to complete a pre-test of the instrument that would provide students' preferred environment. As a follow-up study, it would be interesting to assess students' preferred classroom environment and contrast that with the actual environment. However, to understand the virtual classroom environment better and because a virtual classroom environment can be in many ways substantially different than the traditional classroom, it might be important to assess two different preferred classroom environments. The first administration would examine the preferred classroom environment in general terms. The next administration would examine the students' preferred distance classroom environment, followed by assessing the actual perceptions of the virtual classroom.

Fraser (1981) describes how classroom environmental research can provide a practical basis for aligning the environment to make a better person-environment fit. For example, even though an instructor may not choose for pedagogical reasons to make all adjustments to bring profiles in line, the assessments allow the instructor to know how much weight is placed upon certain scales, i.e., greater emphasis on student cohesiveness than individualization. Finally, the use of the assessment instrument also serves as tool to encourage all those involved to develop greater understanding of the virtual classroom

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